

A new pioneer community with the dominant *Aurinia petraea* on the rockfall screes in the southern Julian Alps (western Slovenia)

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Summary: Applying the standard Central European phytosociological method we studied the pioneer stands with the dominant *Aurinia petraea* in the submontane and lower montane belt of the southern Julian Alps and their foothills. These stands overgrow the newly developed calcareous screes on rockslide areas that resulted from the earthquakes between 1998 and 2004. They are classified into the new association *Arabido turritae-Aurinetum petraeae* ass. nova (alliance *Stipion calamagrostis*), which is treated as a stage in the primary succession sere: scree community – fringe communities of the alliance *Geranion sanguinei* – the coppice forest of hop hornbeam and other deciduous trees. It has been established that pioneer species on rockfall screes are above all those that can tolerate stress and other disturbances, and that can rapidly, with various adaptations (high seed production, short life span) move into new habitats. Similar communities with *Aurinia petraea* were determined also on Holocene screes above Modrež, which are also one of the proposed areas for the Natura 2000 network.

Keywords: primary succession, scree communities, *Aurinia petraea*, *Stipion calamagrostis*, *Arabido turritae-Aurinetum petraeae* ass. nova, phytosociology, ecological strategy types, Natura 2000

Aurinia petraea (syn. *Alyssum petraeum*) is a Southeast European montane species distributed in the Southeastern Alps (some parts of the Carnic and Julian Alps with their foothills), in the Dinaric and Balkan mountains, in Croatia, Bosnia and Herzegovina, Serbia, Macedonia and Bulgaria, in Greece (Epirus) and Romania (the south Carpathians) – see NYÁRÁDY (1955: 324–326), THELLUNG (1958: 280), DIKLIĆ (1972: 290–292), ČERNIC (1977), PIGNATTI (1982: 425), TRINAJSTIĆ (1983: 282), AESCHIMANN et al. (2004: 548). AKEROYD (1993: 370) mentions its distribution from northern Italy to Romania and northern Greece. On the Balkans, HAYEK (1927, reprint 1975: 429) found *Alyssum petraeum* (= *Aurinia petraea*) in the Quarnero, Dalmatia, Bosnia and Herzegovina and Montenegro, and the variety *Alyssum petraeum* var. *edentulum* in Bosnia and Herzegovina (questionable), Serbia, Bulgaria and Macedonia. DIKLIĆ (1972: 292) mentions both varieties for Serbia – var. *petraeum* (eastern Serbia, the Djerdap gorge) and var. *edentulum*. Surina (in litt.) informed us about a probable thriving of *Alyssum petraeum* var. *edentulum* also in the Quarnero. A slightly similar taxon, *Alyssum medium* Host (= *Aurinia media* (Host) Trinajstić) – HAYEK (ibid.), ČERNIC (1977: 72), TRINAJSTIĆ (1983: 284–285), D. Trpin (in litt.), E. Mayer (in litt.) – occurs in the northern part of the Dinaric mountains (e. g. in the Croatian coastal belt from Istria to the Pelješac peninsula, some of the islands).

The distribution of *Aurinia petraea* in the Southeastern Alps (Friuli and western Slovenia) was thoroughly studied by ČERNIC (1977), whereas MAYER (1954: 26), PRAPROTNİK (1988), DAKSKOBLER (1994: 20, 1996 a, b, 2004) and TRPIN & PRAPROTNİK (1994) reported on certain localities. A distribution map of the species in Friuli was published by POLDINI (1991: 179, 2002: 72), and JOGAN et al. (2001: 58) published a map of its distribution in Slovenia. Supplemented

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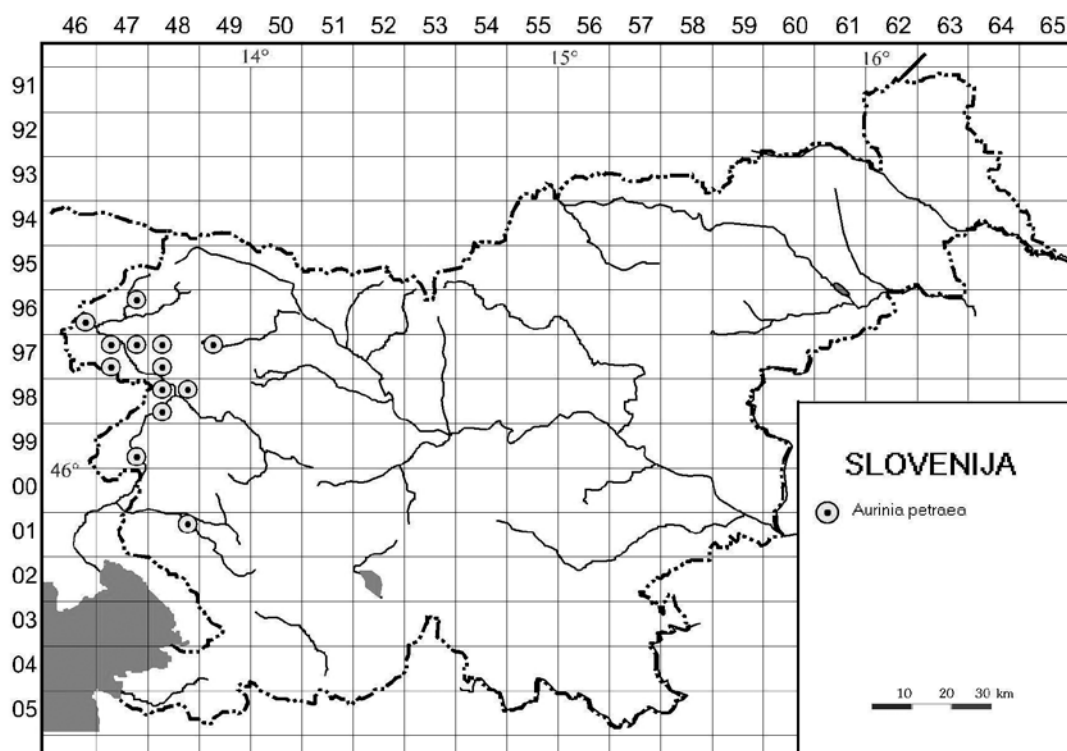


Figure 1: Distribution of *Aurinia petraea* in Slovenia.

with our more current information it is published in figure 1, with consideration of a probably secondary locality near Branik mentioned by ČERNIC (1977: 75) and WRABER (1999: 384). We did not consider Fleischmann's data from 1788 for the Kamnik Alps (the vicinity of Tržič, the Kokra valley), which could not be confirmed (WRABER 1999: 384; TRPIN & PRAPROTNIK 1994: 25).

Aurinia petraea is a species of rock crevices, screes, walls (HAYEK 1927: 429, DIKLIĆ 1972: 292, TRINAJSTIĆ 1983: 282; PIGNATTI 1982: 425; WRABER 1999: 384), stony pastures (POLDINI 1991: 179), and pioneer communities on thermophilous, basiphilous sandy sites, i. e. the communities of the alliance *Alysso-Sedion albi* (see AESCHIMANN et al. 2004: 548).

According to the Database of phytocoenoses of Serbia (LAKUŠIĆ et al. 2005, data arranged and provided by DMITAR LAKUŠIĆ) *Alyssum petraeum* var. *edentulum* was recorded in the following syntaxa: *Syringetum timokense* Knapp 1944 (order *Quercetalia pubescentis*) – KNAPP (1944), *Corylo colurnae-Pinetum nigrae* B. Jovanović 1951 (class *Erico-Pinetea*) – MIŠIĆ (1981), *Saturejo montanae-Achnatheretum calamagrostis* R. Jovanović & S. Jovanović 1986 (order *Drypetalia spinosae*, alliance *Peltarion alliaceae*) – JOVANOVIĆ & JOVANOVIĆ-DUNJIĆ (1986) and *Centaureo derventanae-Seslerietum tenuifoliae* R. Jovanović & S. Jovanović 1986 (class *Asplenietea trichomanis*, order *Amphoricarpetalia*, alliance *Edraianthion jugoslavici*) – JOVANOVIĆ & JOVANOVIĆ-DUNJIĆ (1986).

In Romania, the association *Alysso petraei-Sedetum hispanici* Schneider-Binder et al. 1971 was described and classified into this alliance and into the class *Sedo-Scleranthetea* (= *Koelerio-Coryneporetea*) (SCHNEIDER-BINDER et al. 1971). It was recorded in the Danube gorge on tiny rubble, ledges and convexities in rockwalls.

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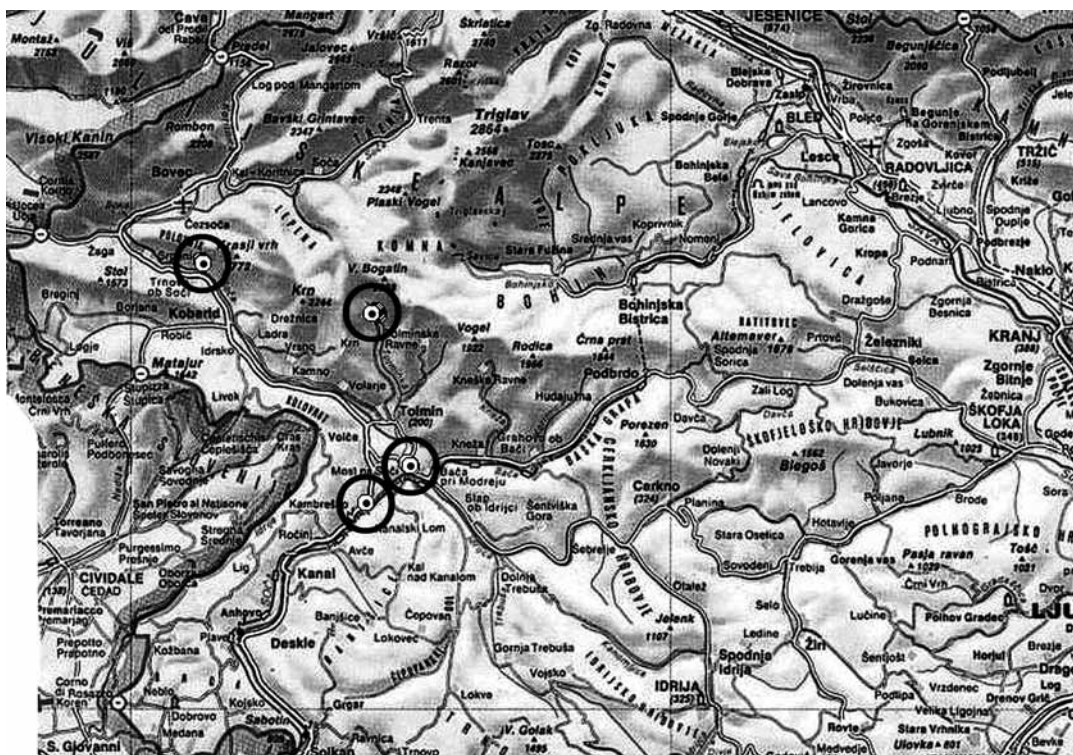


Figure 2: Stands with *Aurinia petraea* in the southern Julian Alps and their foothills (Source: Map of Slovenia 1:750 000, GURS).

In rock crevices, screes and on gravelly or sandy soil it was most frequently recorded in the Upper Soča Valley. In the last few years, its pioneer stands have been regularly spotted, mostly in Morizna (sunny slopes of the Polovnik ridge between Trnovo and Srpenica) and under Osojnica in the Tolminka valley, which are regions where major rockfalls occurred during two strong earthquakes on 12.4.1998 and 12.7.2004 (see, for example RIBIČIČ & VIDRIH 1998, and VIDRIH 1998, 2004, 2005). Here, this species spread from rock crevices to partly still unstabilized, fresh gravel mixed with particles of organic matter and soil which covers the surfaces that were previously (before the rockfall) overgrown with a mixed forest of deciduous trees. Hop hornbeam stands (*Fraxino ornii-Ostryetum* s. lat., incl. *Cytisantho-Ostryetum* and *Seslerio albicantis-Ostryetum*) prevailed on steep slopes where rocks had broken off (relevés 2–6 in tab. 3), and mixed stands of beech and hop hornbeam (*Ostryo-Fagetum*, *Lamio orvalae-Fagetum*) prevailed on old rock slides under the walls (relevés 7–10 in tab. 3). A mixed forest of hornbeam and hop hornbeam (*Asperulo-Carpinetum*) developed in some places at the bottom of gravelly slopes near Modrej (relevés 11–13 in tab. 3).

Materials and methods

Applying the standard Central European phytosociological method (BRAUN-BLANQUET 1964) we made 21 relevés of pioneer stands with the dominant *Aurinia petraea* in the submontane belt of the southern Julian Alps and their foothills (fig. 2), and 13 relevés of hop hornbeam and beech stands in the immediate vicinity. Most relevés were made on rockfall (rockslide) areas below Morizna opposite Trnovo and below Osojnica in the Tolminka valley. Nine relevés (five at the

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edge of the scree, four in the surrounding forest stands) were made on edges of screes below Senica (above Modrej near Most na Soči) and one relevé was made in the rockwalls on the right bank of the Soča between Podsela and Doblar (Loški poldan). The geological bedrock under Morizna, Osojnica and Senica is a Holocene hillside (limestone) scree, talus under Senica (with a considerable admixture of chert), and in Loški poldan Cretaceous limestone (BUSER 1986, 1987). The submontane and lower montane belt of the southern Julian Alps with their foothills has a humid moderate continental climate with mean annual precipitation of over 2000 mm and a mean annual temperature of 8–9°C (MEKINDA-MAJARON 1995, ZUPANČIČ 1995, OGRIN 1996).

The collected relevés were entered into the FloVegSi database (SELIŠKAR et al. 2003) and analysed with methods of hierarchical classification. We tested the following methods: ‘(Unweighted) average linkage method UPGMA’, ‘Incremental sum of squares, MISSQ’ (Wishart’s similarity ratio was applied in both), and ‘Ordinal Clustering, OrdClAn’, where we used Goodman-Kruskal’s γ coefficient. In ordination we tested the principal coordinates analysis (PCoA) and Wishart’s similarity ratio, as well as a non-metric ordination method: Non-metric Multidimensional Scaling (NMDS) and Goodman-Kruskal’s γ coefficient. Combined cover-abundance values were transformed into the ordinal scale following VAN DER MAAREL (1979). We used the program package SYN-TAX 2000 (PODANI 2001). Results of numerical methods were combined with the classic arrangement based on diagnostic species.

Phytosociological groups (= groups of diagnostic species) were formed according to our own criteria, but with consideration of numerous authors. Raunkiaer’s life forms were adopted from POLDINI (1991), who is the basis, together with ‘Flora alpina’ (AESCHIMANN et al. 2004), also in classification of the species into chorological groups. The recorded plants were classified also into ecological strategy types as defined by GRIME (1974, 1979, quoted after GRIME 2001, see also BATIČ 2001). This classification was done on the basis of our own findings and partly with the help of the German BIOLFLOR database (KLOTZ et al. 2002; KLOTZ & KÜHN 2002).

The nomenclature source for the names of vascular plants is the Mala flora Slovenije (MARTINČIČ et al. 1999), and FRAHM & FREY (1992) and MARTINČIČ (2003) for the names of mosses. Syntaxonomic units mentioned in the article and their authors are listed in the Appendix.

Results and discussion

Stands with *Aurinia petraea* on screes in the southern Julian Alps were arranged into a phytosociological table (tab. 1). Our main criterion, when arranging the relevés, were the results of hierarchical classification (figs. 3 and 4). The relevés are roughly united into two groups. The larger group (relevés 1–15) includes the stands on rockfall gravel in Morizna and below Osojnica, and the smaller group (relevés 16–21) the relevés on edges of screes above Modrej and the relevé from Loški poldan. We analysed the composition according to phytosociological groups (groups of diagnostic species); on the one hand together for all the relevés and on the other hand separately for these two groups of relevés (tab. 2).

The studied stands are dominated by the species of thermophilous forest edges (class *Trifolio-Geranietea*, alliance *Geranion sanguinei*), species of dry grasslands (class *Festuco-Brometea*) and scree species s.l. (class *Thlaspietea rotundifolii*). Such floristic composition and a relatively high number of species per relevé is unusual for scree communities (on average 26, standard deviation is 10 and coefficient of variation is 34%; following values in the first group are: average number

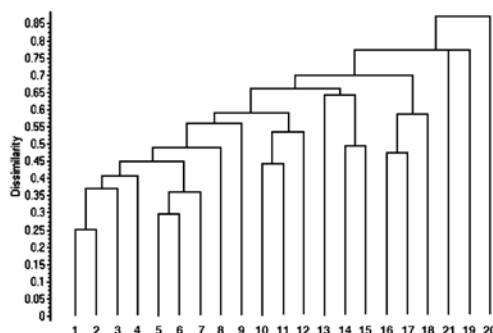
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Figure 3: Dendrogram of the stands with *Aurinia petraea* in the Soča Valley (UPGMA, similarity ratio).

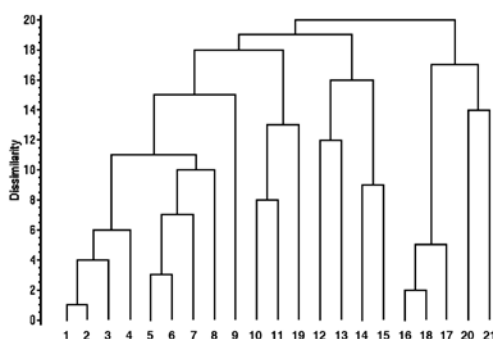


Figure 4: Dendrogram of the stands with *Aurinia petraea* in the Soča Valley (Ordinal Clustering, Goodman-Kruskal's γ).

of species per relevé is 30, standard deviation 6.6 and coefficient of variation 22%). Common species of forest edges and dry grasslands undoubtedly indicate the progress of overgrowth of these screes towards the vegetation growing here before the earthquake and the last rockfalls (the relevés of the first group) or is still growing in the immediate vicinity (indirectly presented in relevés 2–10 in tab. 3). The vegetation clearly shows that the screes in Morizna and below Osojnica are less than ten years old. There are also small particles of organic matter and soil in the gravel (due to the rockfall in the forest belt). Presence of organic matter is indicated for example by two nitrophilous species, *Lapsana communis* and *Urtica dioica*. The community with the dominant *Aurinia petraea* is therefore a succession stage and in several decades a hop hornbeam coppice forest is likely to develop here again. The first pioneers among the scrub and tree species on rockfalls below Osojnica are hop hornbeam, willows (*Salix caprea*, *S. appendiculata*, *S. eleagnos*), flowering ash (*Fraxinus ornus*), hazel (*Corylus avellana*), and traveller's joy (*Clematis vitalba*). The earthquake and rockfalls were an obvious disturbance in the mixed broad-leaved forest's habitat, which caused the destruction of individuals and destroyed a great deal of biomass. The way this vegetation adapted to such a change in less than ten years can be described partly with the analysis of Raunkiaer's life forms and the so called 'Grime's ecological strategy types'. These analyses were done for the pioneer stands with *Aurinia petraea* as well as for the surrounding stands of hop hornbeam and other deciduous trees that were spared by the rockfalls. Their results are presented in tables 4 and 5.

Table 1: *Arabido turritiae-Aurinietum petraeae* ass. nova in the Julian Alps.

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Number of relevé (tab. 1)																									
Differential species of lower units																									
FB	<i>Stachys recta</i>	E1	+	+	+	+	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	12	57	III
EA	<i>Eupatorium cannabinum</i>	E1	+	+	+	1	1	1	+	1	+	+	+	+	+	+	+	+	+	+	+	+	11	52	III
F	<i>Campanula trachelium</i>	E1	r	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	11	52	III
ES	<i>Actinos alpinus</i>	E1	+	+	+	+	+	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	10	48	III
FB	<i>Scabiosa triandra</i>	E1	.	.	.	.	.	.	.	.	+	+	r	+	+	+	+	+	+	+	+	6	29	II	
FB	<i>Medicago lupulina</i>	E1	.	.	.	.	.	.	.	.	1	+	+	+	+	+	+	+	+	+	+	5	24	II	
SM	<i>Galium aparine</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	3	14	I	
FB	<i>Satureja montana</i> subsp. <i>variegata</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	+	.	2	10	I	
Character species of the alliance <i>Stipion calamagrostis</i>																									
TR	<i>Scrophularia juratensis</i>	E1	1	2	1	1	2	2	.	.	.	.	.	.	.	.	.	.	1	2	.	.	9	43	III
TR	<i>Calamintha braunecana</i>	E1	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	+	.	4	19	I
TR	<i>Achnatherum calamagrostis</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5	I
TG	<i>Vincetoxicum hirundinaria</i>	E1	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	+	4	19	I
Differential species of the alliance <i>Stipion calamagrostis</i>																									
TG	<i>Origanum vulgare</i>	E1	1	+	+	+	+	1	1	+	.	1	1	1	.	+	+	.	.	.	.	15	71	IV	
FB	<i>Galium lucidum</i>	E1	r	+	.	+	r	+	+	+	+	1	.	.	+	+	.	.	.	.	.	11	52	III	
KC	<i>Sedum album</i>	E1	+	.	+	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	+	.	6	29	II
TR	<i>Thlaspietea rotundifolii</i> s. lat.	E1	+	1	1	1	.	.	+	r	.	.	+	.	.	.	.	.	.	.	.	8	38	II	
	<i>Cerastium subtriflorum</i>	E1	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	6	29	II	
	<i>Hesperis candida</i>	E1	+	+	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	24	II	
	<i>Petasites paradoxus</i>	E1	r	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	19	I	
	<i>Arabis alpina</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	14	I	
	<i>Iris pallida</i> subsp. <i>cengialti</i>	E1	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	2	10	I	
	<i>Medicago pironae</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	1	5	I
	<i>Hieracium glaucum</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I	
	<i>Seseli goudotii</i>	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	5	I	
	<i>Viola pyrenaica</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5	I	
	<i>Cardaminopsis arenosa</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I	
	<i>Silene vulgaris</i> subsp. <i>glauca</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	5	I

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		Number of relevé (tab. 1)																					Fr.	Cl.	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Pr.		
AT	<i>Festuca calva</i>	E1	.	.	+	.	r	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	4	19	I
	<i>Sesleria caerulea</i> subsp. <i>calcaria</i>	E1	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	1	3	14	I
	<i>Carduus crassifolius</i>	E1	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	2	10	I
	<i>Betonica alopecuroides</i>	E1	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Centauria haynaldii</i> subsp. <i>julica</i>	E1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Asplenietea trichomanis</i>																								
	<i>Kernera saxatilis</i>	E1	1	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	19	I
	<i>Athamania turbinata</i>	E1	.	.	.	.	r	.	.	r	.	.	.	.	r	.	.	.	.	.	+	+	4	19	I
	<i>Ceterach javoricum</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	+	.	.	.	+	3	14	I
	<i>Silene hibernica</i>	E1	+	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	3	14
KC	<i>Moerhousia muscosa</i>	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	2	10	I
	<i>Asplenium ruta-muraria</i>	E1	.	.	.	r	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	2	10	I
	<i>Sedum hispanicum</i>	E1	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	+	2	10	I
	<i>Campanula carnica</i>	E1	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	1	1	5	I
	<i>Asplenium trichomanes</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	2	2	10	I	
	<i>Sedum maximum</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1	2	10	I
	<i>Saxifraga petraea</i>	E1	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Campanula spicata</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1	5	I
	<i>Campanula pyramidalis</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	5	I
	<i>Sempervivum tectorum</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	5	I
GU	<i>Micromeria thymifolia</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5	I
	<i>Koelerio-Corynephoretea</i>																								
	<i>Lactuca perennis</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	1	3	14	I
	<i>Sedum acre</i>	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Sedum sexangulare</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	5	I
	<i>Echium vulgare</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	5	I
	<i>Galio-Urticetea</i>																								
	<i>Lapsana communis</i>	E1	.	.	+	+	.	.	+	+	.	+	.	.	.	+	.	+	.	.	.	.	7	33	II
	<i>Urtica dioica</i>	E1	.	.	+	+	.	+	+	1	+	.	+	.	.	.	.	.	.	.	.	.	7	33	II
	<i>Torilis japonica</i>	E1	r	+	.	+	.	+	r	.	+	.	.	.	.	.	.	.	.	.	.	.	6	29	II
EA	<i>Tussilago farfara</i>	E1	.	+	.	r	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	14	I
	<i>Lamium maculatum</i>	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	+	3	14	I
	<i>Calystegia sepium</i>	E1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	2	10	I
	<i>Epilobietea angustifolii</i> s. lat.												1	.	.	+	.	.	.	.	.	.	9	43	III
	<i>Galopsis speciosa</i>	E1	+	.	+	+	.	+	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	

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Number of relevé (tab. 1)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Pr.	Fr.	Cl.
MA	<i>Silene dioica</i>	E1	+	+	.	.	.	.	+	.	.	1	+	.	.	+	.	.	.	.	.	.	8	38	II
	<i>Carex muricata</i>	E1	.	.	.	.	r	.	+	+	.	.	.	.	.	.	.	.	.	.	.	+	3	14	I
	<i>Solanum dulcamara</i>	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Salix caprea</i>	E1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Fragaria vesca</i>	E1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	5	I
MA	Molinio-Arrhenatheretea																								
	<i>Dactylis glomerata</i>	E1	1	+	1	+	1	1	.	2	.	.	.	.	.	.	.	.	.	.	.	.	8	38	II
	<i>Veronica chamaedrys</i>	E1	.	.	.	+	r	+	+	1	.	.	.	.	.	.	.	+	.	.	.	.	6	29	II
	<i>Centaurea jacea</i>	E1	.	+	.	.	.	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	4	19	I
	<i>Tanacetum officinale</i>	E1	.	.	.	.	.	r	r	.	.	.	1	.	.	.	.	.	.	.	.	.	4	19	I
	<i>Angelica sylvestris</i>	E1	+	+	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	4	19	I
	<i>Lathyrus pratensis</i>	E1	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	2	10	I
	<i>Lotus corniculatus</i>	E1	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	2	10	I
	<i>Galium mollugo</i>	E1	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	Stellarietea mediae																								
SM	<i>Cardamine hirsuta</i>	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	3	14	I
	<i>Myosoton aquaticum</i>	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Senecio vulgaris</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5	I
	<i>Sonchus oleraceus</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5	I
	<i>Veronica hederifolia</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5	I
QP	Quercetalia pubescentis																								
	<i>Ostrya carpinifolia</i>	E1	+	+	.	1	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	6	29	II
	<i>Fraxinus ornus</i>	E1	.	.	.	r	.	.	.	.	.	.	+	.	.	+	.	.	.	.	+	.	4	19	I
	<i>Peucedanum schottii</i>	E1	.	.	.	.	r	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	3	14	I
	<i>Melittis melisophyllum</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	2	10	I
	<i>Hypericum montanum</i>	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Campanula persicifolia</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	Fagetalia sylvaticae																								
	<i>Senecio fuchsii</i>	E1	+	r	.	r	+	.	r	+	.	.	.	.	.	.	.	.	.	.	.	.	7	33	II
	<i>Mycelis muralis</i>	E1	+	+	+	+	+	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	6	29	II
F	<i>Myosotis sylvatica</i>	E1	+	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	4	19	I
	<i>Brachypodium sylvaticum</i>	E1	.	+	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	3	14	I
	<i>Cyclamen purpurascens</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	2	10	I
	<i>Lamium orvala</i>	E1	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	r	.	2	10	I
	<i>Galeobdolon flavidum</i>	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	5	I

A new pioneer community with the dominant *Aurinia petraea* in the Julian Alps

Number of relevé (tab. 1)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Pr.	Fr.	Cl.
QF	<i>Cardamine impatiens</i>	E1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Helleborus niger</i>	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	5	I
	<i>Salvia glutinosa</i>	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	5	I
	<i>Euphorbia amygdaloides</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	5	I
	Quercus-Fagetum																								
	<i>Clematis vitalba</i>	E1	+	+	+	.	.	+	.	.	.	+	.	.	.	.	.	.	r	.	+	.	9	43	III
	<i>Carex digitata</i>	E1	.	.	.	.	r	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	3	14	I
	<i>Festuca heterophylla</i>	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	10	I
	<i>Hedera helix</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	2	10	I
	<i>Vincetoxicum</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	2	10	I
	<i>Hieracium racemosum</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Diactylis polygama</i>	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	5	I
RP	<i>Rubus caesius</i>	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	5	I
	Rhamno-Prunetum																								
	<i>Prunus mahaleb</i>	E2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	2	10	I
	<i>Ligustrum vulgare</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5	I
	<i>Rhamnus catharticus</i>	E2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5	I
	<i>Rhamnus saxatilis</i>	E2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5	I
	<i>Rosa canina</i>	E2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5	I
	Erico-Pinetum																								
	<i>Calamagrostis varia</i>	E1	.	.	.	.	.	r	.	.	.	.	.	.	I	.	.	.	.	.	+	.	3	14	I
	<i>Genista radiata</i>	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I
	<i>Carex alba</i>	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	5	I
	<i>Aquilegia nigricans</i>	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	5	I
ML	<i>Aster amellus</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1	5	I
	Mosses and lichens																								
	<i>Schistidium apocarpum</i>	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	2	10	I
	<i>Anomodon viticulosus</i>	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	1	5	I
	<i>Campylopus lutescens</i>	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	5	I
	<i>Homalothecium sericeum</i>	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	5	I
	<i>Isoetes macrospora</i>	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	5	I
	<i>Dermatocarpon miniatum</i>	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	5	I
	<i>Porella platyphylla</i>	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5	I

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Table 2: Groups of diagnostic species in the stands with *Aurinia petraea* in the Soča Valley.

Phytosociological groups	I	II	Total
<i>Thlaspietea rotundifolii</i>	12	13	12
<i>Trifolio-Geranietea</i>	18	9.2	17
<i>Festuco-Brometea</i>	17	13	16
<i>Asplenietea trichomanis</i>	4.3	12	5.8
<i>Koelerio-Coryneporetea</i>	1.4	5.5	2.2
<i>Elyno-Seslerietea</i>	5.6	0.9	4.7
<i>Epilobietea angustifolii</i> s. lat.	7.4	0.9	6.1
<i>Galio-Urticetea</i>	7.9	5.5	7.4
<i>Molinio-Arrhenatheretea</i>	6.8	0.9	5.6
<i>Stellarietea mediae</i>	0.5	7.3	1.8
<i>Quercetalia pubescentis</i>	5.6	8.3	6.1
<i>Fagetalia sylvaticae</i>	8.1	3.7	7.2
<i>Quercu-Fagetea</i>	3.2	6.4	3.8
<i>Rhamno-Prunetea</i>	0	5.5	1.1
<i>Erico-Pinetea</i>	1.4	0.9	1.3
Mosses and lichens	0	7.3	1.4
Total	100	100	100

The results of these comparisons show that – compared to the surrounding forest stands – the pioneer stands on screes comprise a lot more perennial (hemicryptophytes) and annual plants (therophytes), about the same amount of chamaephytes (dwarf shrubs) and fewer geophytes and phanerophytes (trees and shrubs). In pioneer stands on screes there are more biennial plants and stalked hemicryptophytes (H scap) among hemicryptophytes in proportion to the surrounding forest stands.

Compared to the surrounding forest stands there are a bit more species that can be characterised as intermediate type (csr) – most often they are relatively low, short-lived rosette perennials (H ros) – there are also more ruderal species that tolerate disturbances and stress tolerant species among ecological strategy types in the pioneer stands. In comparison with the pioneer stands, on the other hand, there are a lot more competitors in the surrounding forest stands (i. e. the species that can most effectively use sources available in a given situation – light, water, nutrients), but there are fewer of the other two main ecological strategy types (s, r) and (in most cases) also transitional forms. Pioneers on fresh gravel are therefore species that, at least most of them, tolerate stress and disturbances and that have the ability to adapt rapidly to new sites (habitats) after the rockfalls (e. g. high seed production, short life span). One of such taxa is undoubtedly also the biennial species *Aurinia petraea*. In its first year it develops the vegetative organs and the rosette; provided that the rosette is strong it blossoms and fructifies abundantly the next year (E. Mayer, pers. com.). According to our findings, this species is both, ruderal (adapted to disturbances) – which is the reason why it often grows on secondary sites – and stress tolerant (as it can grow in rock crevices). To a certain degree it is also a competitor, as it can effectively use the sources available in the given conditions.

A new pioneer community with the dominant *Aurinia petraea* in the Julian AlpsTable 3: *Ostrya carpinifolia* and other deciduous trees communities on rockfall areas in Morizna and under Osojnica and on the screes above Modrej.

Number of relevé		1	2	3	4	5	6	7	8	9	10	11	12	13		
Working number		212494	212383	212385	212387	212384	212386	212417	212497	212498	212499	212493	212495	212496		
Altitude in m		240	490	620	610	590	660	850	550	610	620	220	290	300		
Aspect		SW	SSE	SW	SW	SW	SE	SE	SE	SE	S	W	SW	SW		
Slope in degrees		30	45	45	45	30	35	30	30	35	35	10	35	35		
Parent material		Gr	A	A	A	Gr	A	A	Gr	Gr	A	Gr	Gr	Gr		
Soil		Li	R	R	R	R	R	R	R	R	R	R	R	R		
Stoniness in %		40	60	30	50	20	30	40	50	50	30	20	40	50		
Cover in %																
Upper tree layer		E3b	60	70	80	60	90	70	90	80	80	80	90	70	70	
Lower tree layer		E3a					20	10	10	10	10	10	20	30		
Shrub layer		E2	50	40	30	50	40	30	20	30	30	30	60	30		
Herb layer		E1	40	60	70	70	70	70	70	50	70	70	80	70	70	
Moss layer		E0	10	10	10	5	10	10	10	20	15	10	5	10	10	
Maximum diameter		cm	8	8	10	8	17	16	25	20	18	20	22	20	18	
Maximum height		m	20	20	25	20	30	25	60	45	40	40	35	30	30	
Relevé area		m ²	100	200	400	200	400	200	400	400	400	200	200	200	400	
Number of species			63	77	89	54	87	68	74	91	88	75	63	52	55	
Date of taking relevé			4/18/2005	5/12/2006	5/12/2006	5/12/2006	5/12/2006	5/22/2006	5/28/1998	5/28/1998	5/28/1998	4/18/2005	4/18/2005	4/18/2005		
Locality			Modrej	Morizna	Morizna	Morizna	Morizna	Osojnica	Osojnica	Osojnica	Osojnica	Modrej	Modrej	Modrej		
Quadrant			9848/2	9747/1	9747/1	9747/1	9747/1	9748/1	9748/1	9748/1	9748/1	9848/2	9848/2	9848/2		
															Pr.	Fr.
<i>Carpinion orientalis</i>																
<i>Ostrya carpinifolia</i>	E3b	3	3	4	3	4	3	1	3	2	2	1	1	1	13	100
<i>Ostrya carpinifolia</i>	E3a	.	.	.	.	.	.	+	.	1	.	.	.	.	2	15
<i>Ostrya carpinifolia</i>	E2b	1	.	.	+	.	.	.	.	.	.	.	+	.	3	23
<i>Ostrya carpinifolia</i>	E2a	.	+	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Mercurialis ovata</i>	E1	1	.	.	.	.	.	.	.	.	.	+	+	.	3	23
<i>Coronilla emerus</i> subsp. <i>emeroides</i>	E2a	.	1	1	1	.	.	.	.	.	.	.	.	.	3	23
<i>Frangula rupestris</i>	E2a	.	.	.	1	.	.	.	.	.	.	.	.	.	1	8
<i>Frangula rupestris</i>	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	1	8
<i>Sesleria autumnalis</i>	E1	.	.	.	.	.	.	.	+	.	.	.	.	.	1	8
<i>Quercetalia pubescentis</i>																
<i>Arabis turrita</i>	E1	2	1	1	.	1	1	+	1	1	.	+	1	.	10	77
<i>Cornus mas</i>	E2b	.	2	1	+	2	1	.	.	.	.	+	+	1	8	62
<i>Cornus mas</i>	E2a	+	+	.	.	.	+	.	.	.	.	+	.	.	4	31
<i>Fraxinus ornus</i>	E3b	2	3	2	2	2	2	.	+	.	.	.	.	.	7	54
<i>Fraxinus ornus</i>	E3a	.	.	1	.	1	1	.	1	1	1	.	1	2	8	62
<i>Fraxinus ornus</i>	E2b	1	1	1	1	1	.	.	+	+	.	.	.	.	7	54
<i>Fraxinus ornus</i>	E2a	.	2	2	1	3	1	.	1	.	.	.	.	.	6	46
<i>Fraxinus ornus</i>	E1	.	.	1	.	.	+	+	.	.	.	.	.	.	3	23

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Number of relevé (tab. 3)		1	2	3	4	5	6	7	8	9	10	11	12	13	Pr.	Fr.
<i>Euonymus verrucosa</i>	E2a	1	.	+	+	+	1	.	.	.	+	.	.	.	6	46
<i>Sorbus aria</i>	E3b	.	.	1	.	.	1	r	r	+	+	.	.	.	6	46
<i>Sorbus aria</i>	E3a	.	.	+	.	+	.	.	+	+	+	.	.	.	5	38
<i>Sorbus aria</i>	E2b	.	.	.	+	+	+	+	.	+	+	.	.	.	6	46
<i>Sorbus aria</i>	E2a	.	+	.	.	+	.	.	.	.	+	.	.	.	3	23
<i>Sorbus aria</i>	E1	.	.	+	.	+	.	.	.	.	.	.	.	.	2	15
<i>Tamus communis</i>	E1	.	+	.	+	+	+	.	.	.	.	.	+	+	6	46
<i>Campanula persicifolia</i>	E1	.	+	+	.	1	.	.	.	.	.	.	.	+	4	31
<i>Betonica officinalis</i>	E1	.	.	.	.	.	.	.	+	+	1	.	.	.	3	23
<i>Clematis recta</i>	E1	.	+	.	+	.	.	.	.	.	+	.	.	.	3	23
<i>Convallaria majalis</i>	E1	.	.	+	.	.	+	.	.	.	+	.	.	.	3	23
<i>Hypericum montanum</i>	E1	.	.	+	.	.	.	.	.	+	+	.	.	.	3	23
<i>Ruscus aculeatus</i>	E2a	.	.	.	.	.	.	.	.	.	.	+	4	3	3	23
<i>Peucedanum schottii</i>	E1	.	+	.	.	+	.	.	.	.	.	.	.	.	2	15
<i>Quercus cerris</i>	E3b	.	.	.	.	.	.	.	.	.	.	1	r	.	2	15
<i>Orchis signifera</i>	E1	.	.	.	.	.	.	.	.	.	+	.	.	.	1	8
<i>Quercus pubescens</i>	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	1	8
<i>Tanacetum corymbosum</i>	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Viola alba</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	1	8
Aremonio-Fagion																
<i>Cyclamen purpurascens</i>	E1	1	1	1	1	1	+	+	+	+	+	1	+	1	13	100
<i>Anemone trifolia</i>	E1	.	+	.	.	1	1	+	1	1	1	2	.	.	8	62
<i>Cardamine enneaphyllos</i>	E1	.	.	+	.	.	.	1	1	.	+	.	2	.	5	38
<i>Lamium orvala</i>	E1	.	.	.	.	.	.	2	+	.	.	+	2	.	4	31
<i>Helleborus niger</i>	E1	.	+	+	.	.	1	.	.	.	.	.	.	.	3	23
<i>Rhamnus fallax</i>	E2b	.	.	.	.	.	.	+	.	r	.	.	.	.	2	15
<i>Rhamnus fallax</i>	E2a	.	.	.	.	.	.	.	.	+	+	.	.	.	2	15
<i>Hacquetia epipactis</i>	E1	.	.	.	.	.	.	.	.	.	.	1	.	.	1	8
Erythronio-Carpinion																
<i>Primula vulgaris</i>	E1	.	1	+	.	1	1	1	+	+	1	1	1	1	11	85
<i>Helleborus odoratus</i>	E1	.	.	.	.	+	1	.	.	.	.	2	2	2	5	38
<i>Ornithogalum pyrenaicum</i>	E1	.	.	.	.	.	.	1	.	.	.	.	.	.	1	8
<i>Galanthus nivalis</i>	E1	.	.	.	.	.	.	.	.	.	.	1	.	.	1	8
Fagetalia sylvaticae																
<i>Campanula trachelium</i>	E1	+	+	+	.	1	+	+	+	1	1	+	.	+	11	85
<i>Asarum europaeum</i> subsp. <i>caucasicum</i>	E1	.	+	.	.	1	1	1	1	+	1	+	+	1	10	77
<i>Euphorbia amygdaloides</i>	E1	1	1	.	.	.	.	+	+	+	+	+	1	2	9	69
<i>Galium laevigatum</i>	E1	1	+	+	.	1	1	+	1	1	1	.	.	.	9	69
<i>Lathyrus vernus</i>	E1	.	+	1	.	+	+	+	.	.	+	+	+	.	8	62
<i>Salvia glutinosa</i>	E1	+	r	+	.	+	.	1	+	1	1	.	.	.	8	62
<i>Acer platanoides</i>	E3b	.	.	.	.	.	.	+	r	r	.	.	.	.	3	23
<i>Acer platanoides</i>	E3a	.	.	.	.	.	.	.	.	.	.	.	+	.	1	8
<i>Acer platanoides</i>	E2b	.	.	.	.	.	.	.	.	.	.	+	.	+	2	15
<i>Acer platanoides</i>	E2a	.	.	.	.	.	.	.	.	.	.	.	+	.	1	8
<i>Acer platanoides</i>	E1	.	.	.	.	.	.	+	+	+	.	1	+	+	6	46
<i>Fraxinus excelsior</i>	E3b	.	.	.	.	r	.	1	r	.	.	1	2	+	6	46
<i>Fraxinus excelsior</i>	E3a	.	.	.	.	.	.	.	.	.	.	.	1	.	1	8
<i>Fraxinus excelsior</i>	E2b	.	.	.	.	.	.	.	.	.	.	.	1	+	2	15
<i>Fraxinus excelsior</i>	E2a	.	.	.	.	.	.	+	+	.	.	2	1	.	4	31
<i>Fraxinus excelsior</i>	E1	.	.	.	.	.	.	1	.	.	.	1	1	.	3	23
<i>Galeobdolon flavidum</i>	E1	.	.	.	.	+	.	+	1	1	.	+	.	+	6	46
<i>Mercurialis perennis</i>	E1	.	.	.	.	+	1	1	.	2	1	+	.	.	6	46

A new pioneer community with the dominant *Aurinia petraea* in the Julian Alps

Number of relevé (tab. 3)		1	2	3	4	5	6	7	8	9	10	11	12	13	Pr.	Fr.
<i>Dryopteris filix-mas</i>	E1	.	.	.	.	+	.	1	1	1	+	.	.	+	6	46
<i>Carpinus betulus</i>	E3b	.	.	.	.	+	.	.	r	.	.	3	3	4	5	38
<i>Carpinus betulus</i>	E3a	.	.	r	.	.	.	.	.	.	.	1	1	1	4	31
<i>Carpinus betulus</i>	E2b	.	.	.	.	.	.	.	.	.	.	.	+	.	1	8
<i>Carpinus betulus</i>	E1	.	.	r	.	+	.	.	.	.	.	+	.	1	4	31
<i>Fagus sylvatica</i>	E3b	.	.	.	.	.	.	4	2	3	3	1	.	.	5	38
<i>Fagus sylvatica</i>	E3a	.	.	r	.	.	.	+	+	1	.	+	.	.	5	38
<i>Fagus sylvatica</i>	E2b	.	.	.	.	.	.	.	+	+	+	.	.	.	3	23
<i>Fagus sylvatica</i>	E1	.	.	.	.	.	.	+	.	.	.	+	.	.	2	15
<i>Mycelis muralis</i>	E1	.	.	.	.	+	.	+	+	1	.	.	+	.	5	38
<i>Brachypodium sylvaticum</i>	E1	.	.	.	.	+	+	.	+	.	.	+	.	.	4	31
<i>Cardamine impatiens</i>	E1	.	.	.	.	.	.	.	r	.	.	+	+	+	4	31
<i>Daphne mezereum</i>	E2a	.	.	.	.	.	.	+	+	+	+	.	.	.	4	31
<i>Melica nutans</i>	E1	+	.	.	.	.	.	.	.	+	+	+	.	.	4	31
<i>Phyllitis scolopendrium</i>	E1	.	.	.	.	.	.	1	1	+	.	.	.	+	4	31
<i>Sambucus nigra</i>	E2b	.	.	.	.	.	.	+	+	.	.	.	1	+	4	31
<i>Sambucus nigra</i>	E2a	.	.	.	.	.	.	.	.	+	.	.	.	.	1	8
<i>Sambucus nigra</i>	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	1	8
<i>Acer pseudoplatanus</i>	E3b	.	.	.	.	.	.	1	.	.	.	.	.	.	1	8
<i>Acer pseudoplatanus</i>	E1	.	.	r	.	.	+	1	.	.	.	.	.	.	3	23
<i>Cardamine bulbifera</i>	E1	.	.	.	.	.	.	+	.	.	.	.	2	2	3	23
<i>Actaea spicata</i>	E1	.	.	.	.	.	.	.	+	+	+	.	.	.	3	23
<i>Epipactis helleborine</i>	E1	.	.	.	.	.	.	.	+	+	+	.	.	.	3	23
<i>Laburnum alpinum</i>	E3b	.	.	.	.	.	.	.	.	r	r	.	.	.	2	15
<i>Laburnum alpinum</i>	E3a	.	.	.	.	.	.	.	.	.	+	.	.	.	1	8
<i>Laburnum alpinum</i>	E2b	.	.	.	.	.	.	.	+	+	+	.	.	.	3	23
<i>Laburnum alpinum</i>	E2a	.	.	.	.	.	.	.	.	+	+	.	.	.	2	15
<i>Tilia cordata</i>	E3b	.	.	.	.	.	.	.	.	.	.	1	+	+	3	23
<i>Tilia cordata</i>	E3a	.	.	r	.	.	.	.	.	.	.	.	.	.	1	8
<i>Tilia cordata</i>	E2a	.	.	+	.	.	.	.	.	.	.	+	.	.	2	15
<i>Tilia cordata</i>	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	1	8
<i>Tilia platyphyllos</i>	E3b	.	.	.	.	.	+	r	.	.	.	.	1	.	3	23
<i>Tilia platyphyllos</i>	E3a	.	.	r	.	.	.	+	.	.	.	.	+	.	3	23
<i>Tilia platyphyllos</i>	E2b	.	.	+	.	.	.	.	.	.	.	+	.	.	2	15
<i>Tilia platyphyllos</i>	E2a	.	.	.	.	.	.	.	.	.	.	+	.	.	1	8
<i>Tilia platyphyllos</i>	E1	.	.	.	.	.	+	+	.	.	.	.	.	.	2	15
<i>Polystichum aculeatum</i>	E1	.	.	.	.	.	.	.	1	.	.	.	+	+	3	23
<i>Neottia nidus-avis</i>	E1	.	.	.	.	+	+	.	.	.	.	.	.	.	2	15
<i>Festuca altissima</i>	E1	.	.	.	.	.	.	+	+	.	.	.	.	.	2	15
<i>Milium effusum</i>	E1	.	.	.	.	.	.	r	1	.	.	.	.	.	2	15
<i>Myosotis sylvatica</i>	E1	.	.	.	.	.	.	+	1	.	.	.	.	.	2	15
<i>Corydalis cava</i>	E1	.	.	.	.	.	.	+	.	.	.	+	.	.	2	15
<i>Epilobium montanum</i>	E1	.	.	.	.	.	.	.	+	+	.	.	.	.	2	15
<i>Scrophularia nodosa</i>	E1	.	.	.	.	.	.	.	1	+	.	.	.	.	2	15
<i>Ulmus glabra</i>	E3b	.	.	.	.	.	.	.	r	r	.	.	.	.	2	15
<i>Ulmus glabra</i>	E3a	.	.	.	.	.	.	.	.	r	.	.	.	.	1	8
<i>Ulmus glabra</i>	E2a	.	.	.	.	.	.	.	+	+	.	.	.	.	2	15
<i>Urtica dioica</i>	E1	.	.	.	.	.	.	.	+	+	.	.	.	.	2	15
<i>Viola reichenbachiana</i>	E1	.	.	.	.	.	.	.	+	.	+	.	.	.	2	15
<i>Euphorbia dulcis</i>	E1	.	.	.	.	.	.	.	.	.	.	1	+	.	2	15
<i>Prunus avium</i>	E3b	.	.	.	.	.	.	.	.	.	.	+	.	+	2	15
<i>Prunus avium</i>	E3a	.	.	.	.	.	.	.	.	.	.	.	.	+	1	8
<i>Prunus avium</i>	E1	.	.	.	.	.	.	.	.	.	.	+	.	+	2	15

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Number of relevé (tab. 3)		1	2	3	4	5	6	7	8	9	10	11	12	13	Pr.	Fr.
<i>Symphytum tuberosum</i>	E1	.	.	.	.	.	.	.	.	.	.	+	.	+	2	15
<i>Lonicera alpigena</i>	E2a	.	.	.	.	.	.	+	.	.	.	.	.	.	1	8
<i>Lunaria rediviva</i>	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	1	8
<i>Poa nemoralis</i>	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	1	8
<i>Polygonatum multiflorum</i>	E1	.	.	.	.	.	.	.	+	.	.	.	.	.	1	8
<i>Galium odoratum</i>	E1	.	.	.	.	.	.	.	.	.	.	+	.	.	1	8
<i>Arum maculatum</i> agg.	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	1	8
Quercetalia roboris																
<i>Hieracium racemosum</i>	E1	.	+	.	.	.	+	.	.	.	+	.	.	.	3	23
<i>Peridium aquilinum</i>	E1	.	r	.	.	.	.	.	r	.	+	.	.	.	3	23
<i>Quercus petraea</i>	E1	.	.	+	.	.	+	.	.	.	.	.	.	.	2	15
<i>Festuca heterophylla</i>	E1	.	.	.	.	+	.	1	.	+	.	.	.	.	3	23
<i>Rubus hirtus</i>	E2a	.	.	.	.	.	.	.	+	r	.	.	.	.	2	15
<i>Quercus petraea</i>	E3b	.	.	.	.	.	.	.	.	.	.	+	.	.	1	8
Quercio-Fagetia																
<i>Vinca minor</i>	E1	+	1	1	.	1	1	.	1	+	1	2	2	1	11	85
<i>Carex digitata</i>	E1	.	1	1	+	1	1	.	1	+	+	+	.	.	9	69
<i>Melittis melissophyllum</i>	E1	.	1	1	1	1	1	r	+	+	1	.	.	.	9	69
<i>Corylus avellana</i>	E2b	.	.	.	.	+	1	1	1	1	1	+	+	.	8	62
<i>Corylus avellana</i>	E2a	+	.	.	.	.	.	.	+	.	+	+	.	.	4	31
<i>Hepatica nobilis</i>	E1	.	+	1	.	1	+	.	+	+	+	1	.	.	8	62
<i>Listera ovata</i>	E1	+	.	.	.	.	+	.	+	+	+	+	.	+	7	54
<i>Lonicera xylosteum</i>	E2	1	.	.	.	1	.	.	+	.	+	+	+	+	7	54
<i>Veratrum nigrum</i>	E1	.	.	.	.	+	+	1	+	+	+	.	.	.	6	46
<i>Clematis vitalba</i>	E3a	.	.	.	.	.	.	.	+	.	.	.	.	.	1	8
<i>Clematis vitalba</i>	E2b	.	.	.	.	+	+	.	.	.	.	.	1	.	3	23
<i>Clematis vitalba</i>	E2a	+	.	.	.	.	.	+	.	.	.	+	1	+	5	38
<i>Acer campestre</i>	E3b	.	.	.	.	.	.	.	.	.	.	+	1	2	3	23
<i>Acer campestre</i>	E3a	.	.	.	.	.	.	.	.	.	.	+	1	1	3	23
<i>Acer campestre</i>	E2b	.	.	.	.	.	.	.	.	.	.	+	1	1	3	23
<i>Acer campestre</i>	E2a	.	.	.	.	.	.	.	.	.	.	1	.	+	2	15
<i>Acer campestre</i>	E1	+	.	+	.	.	.	.	.	.	.	+	.	+	4	31
<i>Dactylis polygama</i>	E1	.	.	.	.	.	+	1	1	1	.	.	.	.	4	31
<i>Viola riviniana</i>	E1	.	+	+	.	+	+	.	.	.	.	.	.	.	4	31
<i>Hedera helix</i>	E3b	.	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Hedera helix</i>	E3a	1	.	.	.	.	.	.	.	.	.	2	.	2	3	23
<i>Hedera helix</i>	E2a	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Hedera helix</i>	E1	1	.	.	.	.	+	.	.	.	.	1	1	.	4	31
<i>Moebringia trinervia</i>	E1	.	.	.	.	.	.	.	+	+	.	.	+	1	4	31
<i>Stellaria holostea</i>	E1	+	.	.	.	.	.	.	.	.	.	3	2	2	4	31
<i>Cephalanthera longifolia</i>	E1	.	.	.	.	+	.	.	.	+	+	.	.	.	3	23
<i>Rubus caesius</i>	E2a	+	.	.	.	+	.	.	.	.	.	.	.	.	2	15
<i>Viola mirabilis</i>	E1	.	.	+	.	.	.	.	.	.	.	.	+	.	2	15
<i>Rosa arvensis</i>	E2a	r	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Cruciata glabra</i>	E1	.	.	.	.	+	.	.	.	.	.	.	.	.	1	8
Rhamno-Prunetea																
<i>Euonymus europaea</i>	E2b	.	.	.	.	.	.	.	.	.	.	.	+	.	1	8
<i>Euonymus europaea</i>	E2a	.	.	.	.	.	+	.	+	.	.	+	+	+	5	38
<i>Crataegus monogyna</i>	E3a	.	.	.	.	.	.	.	.	.	.	.	+	.	1	8
<i>Crataegus monogyna</i>	E2b	+	+	.	.	.	.	.	.	.	.	.	+	+	4	31
<i>Crataegus monogyna</i>	E2a	+	+	+	.	.	.	.	.	.	.	+	.	.	4	31
<i>Crataegus monogyna</i>	E1	.	.	.	.	.	.	.	.	.	.	+	.	.	1	8
<i>Rhamnus catharticus</i>	E3b	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8

A new pioneer community with the dominant *Aurinia petraea* in the Julian Alps

Number of relevé (tab. 3)		1	2	3	4	5	6	7	8	9	10	11	12	13	Pr.	Fr.
<i>Rhamnus catharticus</i>	E2b	1	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Rhamnus catharticus</i>	E2a	1	.	+	.	.	+	.	+	.	.	.	.	.	4	31
<i>Ligustrum vulgare</i>	E2b	1	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Ligustrum vulgare</i>	E2a	.	+	.	.	.	.	.	.	.	.	.	+	+	3	13
<i>Cornus sanguinea</i>	E2b	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Cornus sanguinea</i>	E2a	+	.	.	.	+	.	.	.	.	.	.	.	.	2	15
<i>Rubus fruticosus</i> agg.	E2a	+	.	.	.	.	.	.	.	.	.	.	2	.	2	15
<i>Viburnum lantana</i>	E2b	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Viburnum lantana</i>	E2a	1	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Rosa canina</i>	E2b	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Rosa glauca</i>	E2a	.	.	.	+	.	.	.	.	.	.	.	.	.	1	8
<i>Berberis vulgaris</i>	E2a	.	.	.	.	.	.	.	+	.	.	.	.	.	1	8
Erico-Pineteta																
<i>Calamagrostis varia</i>	E1	.	+	+	.	+	+	.	.	+	+	.	.	.	6	46
<i>Carex alba</i>	E1	.	.	.	.	3	3	.	+	1	2	+	.	.	6	46
<i>Aster amellus</i>	E1	+	+	+	1	.	.	.	.	.	.	.	.	.	4	31
<i>Cirsium erisithales</i>	E1	.	.	.	.	.	.	+	.	+	+	.	.	.	3	23
<i>Chamaecytisus hirsutus</i>	E1	.	.	+	+	.	.	.	.	.	.	.	.	.	2	15
<i>Genista radiata</i>	E2a	.	.	r	3	.	.	.	.	.	.	.	.	.	2	15
<i>Polygala chamaebuxus</i>	E1	.	.	+	1	.	.	.	.	.	.	.	.	.	2	15
<i>Berberis vulgaris</i>	E2b	1	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Amelanchier ovalis</i>	E2b	.	.	.	+	.	.	.	.	.	.	.	.	.	1	8
<i>Amelanchier ovalis</i>	E2a	.	.	.	+	.	.	.	.	.	.	.	.	.	1	8
<i>Carex ornithopoda</i>	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	1	8
<i>Leontodon incanus</i>	E1	.	.	.	1	.	.	.	.	.	.	.	.	.	1	8
Vaccinio-Piceeteta																
<i>Solidago virgaurea</i>	E1	+	r	+	.	+	.	.	.	+	+	+	.	.	7	54
<i>Hieracium murorum</i>	E1	.	+	+	.	.	.	.	.	+	+	.	.	.	4	31
<i>Luzula luzuloides</i>	E1	.	.	.	.	.	.	+	+	1	+	.	.	.	4	31
<i>Veronica urticifolia</i>	E1	.	.	.	.	.	.	+	+	+	+	.	.	.	4	31
<i>Aposeris foetida</i>	E1	.	.	.	.	.	.	1	.	+	.	.	.	.	2	15
<i>Gentiana asclepiadea</i>	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	1	8
<i>Abies alba</i>	E1	.	.	.	.	.	.	.	.	.	.	+	.	.	1	8
<i>Picea abies</i>	E3b	.	.	.	.	.	.	.	.	.	.	r	.	.	1	8
Mulgedio-Aconitetea																
<i>Aconitum angustifolium</i>	E1	.	.	.	.	+	.	1	+	+	1	.	.	.	5	38
<i>Tephrosieris pseudocrispa</i>	E1	.	.	.	.	.	.	+	1	1	+	.	.	.	4	31
<i>Silene dioica</i>	E1	.	.	.	.	.	.	+	+	+	.	.	.	.	3	23
<i>Hesperis candida</i>	E1	.	.	.	.	.	+	+	.	.	.	.	.	.	2	15
<i>Aconitum degenii</i> subsp. <i>paniculatum</i>	E1	.	.	.	.	.	.	1	+	.	.	.	.	.	2	15
<i>Senecio fuchsii</i>	E1	.	.	.	.	.	.	1	+	.	.	.	.	.	2	15
<i>Aconitum lycoctonum</i>	E1	.	.	.	.	.	.	.	+	.	.	+	.	.	2	15
<i>Phyteuma ovatum</i>	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	1	8
<i>Athyrium filix-femina</i>	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	1	8
Trifolio-Geranietea																
<i>Vincetoxicum hirundinaria</i>	E1	+	1	+	1	.	+	+	+	+	1	.	.	+	10	77
<i>Digitalis grandiflora</i>	E1	+	+	+	.	+	+	+	+	+	+	.	.	.	9	69
<i>Valeriana collina</i>	E1	1	+	+	.	+	+	+	+	+	+	.	.	.	9	69
<i>Campanula rapunculoides</i>	E1	.	+	+	+	1	1	.	.	.	.	+	1	2	8	62
<i>Clinopodium vulgare</i>	E1	.	+	+	.	1	+	.	r	+	+	.	.	.	7	54
<i>Libanotis sibirica</i> subsp. <i>montana</i>	E1	.	+	+	+	+	+	.	.	+	+	.	.	.	7	54
<i>Silene nutans</i>	E1	.	1	+	+	+	+	.	.	+	+	.	.	.	7	54

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Number of relevé (tab. 3)		1	2	3	4	5	6	7	8	9	10	11	12	13	Pr.	Fr.
<i>Anthericum ramosum</i>	E1	.	+	1	1	+	+	.	.	.	+	.	.	.	6	46
<i>Lilium carnolicum</i>	E1	.	r	+	.	+	.	r	.	.	.	.	+	.	5	38
<i>Viola hirta</i>	E1	.	+	+	1	+	+	.	.	.	.	.	.	.	5	38
<i>Polygonatum odoratum</i>	E1	.	.	+	1	+	+	.	.	.	.	.	.	.	4	31
<i>Thesium bavarum</i>	E1	.	+	+	+	.	.	.	.	.	.	.	.	.	3	23
<i>Verbascum alpinum</i>	E1	.	.	.	.	.	.	.	+	+	+	.	.	.	3	23
<i>Origanum vulgare</i>	E1	+	1	.	.	.	.	.	.	.	.	.	.	.	2	15
<i>Hypericum perforatum</i>	E1	+	.	.	.	.	.	.	.	.	+	.	.	.	2	15
<i>Verbascum lychnitis</i>	E1	+	.	.	.	.	.	.	+	.	.	.	.	.	2	15
<i>Thalictrum minus</i>	E1	.	.	.	+	+	.	.	.	.	.	.	.	.	2	15
<i>Achillea distans</i>	E1	.	.	.	.	.	.	.	.	+	+	.	.	.	2	15
<i>Inula conyza</i>	E1	.	.	.	.	+	.	.	.	.	.	.	.	.	1	8
<i>Trifolium rubens</i>	E1	.	.	.	.	+	.	.	.	.	.	.	.	.	1	8
<i>Valeriana nemorensis</i>	E1	.	.	.	.	+	.	.	.	.	.	.	.	.	1	8
<i>Laserpitium latifolium</i>	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	1	8
<i>Epilobietea angustifolii</i>																
<i>Fragaria vesca</i>	E1	+	1	+	.	1	1	.	+	+	+	.	.	.	8	62
<i>Carex muricata</i>	E1	.	.	.	.	.	.	.	+	+	.	.	.	+	3	23
<i>Rubus idaeus</i>	E2a	.	.	.	.	.	.	+	.	.	.	.	.	.	1	8
<i>Solanum dulcamara</i>	E1	.	.	.	.	.	.	.	r	.	.	.	.	.	1	8
<i>Physalis alkekengi</i>	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	1	8
<i>Festuco-Brometea</i>																
<i>Buphthalmum salicifolium</i>	E1	+	.	+	+	.	.	.	.	+	+	.	.	.	5	38
<i>Carex humilis</i>	E1	.	3	1	1	1	+	.	.	.	.	.	.	.	5	38
<i>Ajuga genevensis</i>	E1	1	1	+	.	+	.	.	.	.	.	.	.	.	4	31
<i>Allium carinatum</i>	E1	.	+	.	.	+	+	.	.	.	1	.	.	.	4	31
<i>Dianthus monspessulanus</i>	E1	.	1	1	.	+	.	.	.	.	+	.	.	.	4	31
<i>Euphorbia cyparissias</i>	E1	.	.	+	1	+	.	.	.	.	+	.	.	.	4	31
<i>Galium purpureum</i>	E1	.	+	+	1	+	.	.	.	.	.	.	.	.	4	31
<i>Genista tinctoria</i>	E1	.	+	1	.	+	.	.	.	.	+	.	.	.	4	31
<i>Peucedanum oreoselinum</i>	E1	.	+	+	+	.	.	.	.	.	+	.	.	.	4	31
<i>Teucrium chamaedrys</i>	E1	.	1	+	1	+	.	.	.	.	.	.	.	.	4	31
<i>Stachys recta</i>	E1	+	.	1	+	.	.	.	.	.	.	.	.	.	3	23
<i>Arabis hirsuta</i>	E1	.	+	+	.	.	.	.	.	.	.	.	.	.	2	15
<i>Bromus erectus</i>	E1	.	1	.	.	+	.	.	.	.	.	.	.	.	2	15
<i>Satureja montana</i> subsp. <i>variegata</i>	E1	.	+	.	1	.	.	.	.	.	.	.	.	.	2	15
<i>Scabiosa triandra</i>	E1	.	+	.	+	.	.	.	.	.	.	.	.	.	2	15
<i>Centaurea triumfettii</i>	E1	.	.	+	+	.	.	.	.	.	.	.	.	.	2	15
<i>Galium lucidum</i>	E1	.	.	.	+	+	.	.	.	.	.	.	.	.	2	15
<i>Brachypodium rupestre</i>	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Helianthemum ovatum</i>	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	1	8
<i>Molinio-Arrhenatheretea</i>																
<i>Veronica chamaedrys</i>	E1	1	+	.	.	+	.	.	+	+	.	.	.	1	6	46
<i>Achillea millefolium</i>	E1	.	.	+	.	+	+	.	.	.	.	.	.	.	3	23
<i>Angelica sylvestris</i>	E1	.	.	.	.	.	.	.	r	+	.	.	.	.	2	15
<i>Centaurea jacea</i> agg.	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	1	8
<i>Phyteuma zahlbruckneri</i>	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	1	8
<i>Galium mollugo</i>	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	1	8
<i>Taraxacum officinale</i>	E1	.	.	.	.	.	.	.	.	.	.	r	.	.	1	8
<i>Ajuga reptans</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	1	8
<i>Galio-Urticetea</i>																
<i>Geranium robertianum</i>	E1	+	.	.	.	.	.	+	1	1	+	.	.	+	6	46

A new pioneer community with the dominant *Aurinia petraea* in the Julian Alps

Number of relevé (tab. 3)		1	2	3	4	5	6	7	8	9	10	11	12	13	Pr.	Fr.
<i>Geum urbanum</i>	E1	.	.	.	.	.	+	.	+	.	.	+	1	+	5	38
<i>Torilis japonica</i>	E1	.	.	.	.	.	r	.	r	.	.	.	+	.	3	23
<i>Glechoma hederacea</i>	E1	.	.	.	.	.	.	.	.	.	.	1	1	+	3	23
<i>Lamium maculatum</i>	E1	.	.	.	.	.	.	.	.	.	.	.	2	1	2	15
<i>Lapsana communis</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	1	8
<i>Elyno-Seslerietea</i>																
<i>Festuca calva</i>	E1	.	r	+	.	r	.	.	.	+	.	.	.	.	4	31
<i>Carduus crassifolius</i>	E1	.	+	+	+	.	.	.	.	.	.	.	.	.	3	23
<i>Phyteuma orbiculare</i>	E1	.	.	+	.	.	.	.	.	+	+	.	.	.	3	23
<i>Sesleria caerulea</i> subsp. <i>calcaria</i>	E1	.	1	3	4	.	.	.	.	.	.	.	.	.	3	23
<i>Acinos alpinus</i>	E1	.	+	+	.	.	.	.	.	.	.	.	.	.	2	15
<i>Betonica alopecuroides</i>	E1	.	.	+	.	.	.	.	.	.	+	.	.	.	2	15
<i>Asperula aristata</i>	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	1	8
<i>Thlaspietea rotundifolii</i>																
<i>Hieracium porrifolium</i>	E1	.	+	+	+	.	.	.	.	.	.	.	.	.	3	23
<i>Viola pyrenaica</i>	E1	.	+	.	+	.	+	.	.	.	.	.	.	.	3	23
<i>Cerastium subtriflorum</i>	E1	.	.	.	.	.	.	1	+	+	.	.	.	.	3	23
<i>Hieracium bifidum</i>	E1	+	.	.	+	.	.	.	.	.	.	.	.	.	2	15
<i>Aurinia petraea</i>	E1	1	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Calamintha brauneana</i>	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Medicago pironae</i>	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Silene vulgaris</i> subsp. <i>glareosa</i>	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Hieracium glaucum</i>	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	1	8
<i>Gymnocarpium robertianum</i>	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	1	8
<i>Arabis alpina</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	r	1	8
<i>Asplenietea trichomanis</i>																
<i>Asplenium trichomanes</i>	E1	1	1	+	.	+	1	+	+	+	+	+	+	+	12	92
<i>Moehringia muscosa</i>	E1	1	1	+	1	1	1	+	1	.	.	.	.	.	8	62
<i>Asplenium ruta-muraria</i>	E1	.	1	1	+	+	1	+	.	+	.	.	.	.	7	54
<i>Polypodium vulgare</i>	E1	+	.	+	.	+	+	.	.	+	.	.	.	.	5	38
<i>Campanula carnica</i>	E1	.	+	+	+	.	.	.	.	+	.	.	.	.	4	31
<i>Sedum maximum</i>	E1	+	+	.	.	+	.	.	.	.	.	.	.	.	3	23
<i>Asplenium adiantum-nigrum</i>	E1	+	.	.	.	.	.	.	.	.	.	.	+	+	3	23
<i>Ceterach javorkeanum</i>	E1	+	.	.	+	.	.	.	.	.	.	.	.	+	3	23
<i>Saxifraga petraea</i>	E1	.	.	.	.	.	.	+	+	+	.	.	.	.	3	23
<i>Sedum album</i>	E1	+	.	+	.	.	.	.	.	.	.	.	.	.	2	15
<i>Campanula spicata</i>	E1	.	.	+	+	.	.	.	.	.	.	.	.	.	2	15
<i>Cystopteris fragilis</i>	E1	.	.	.	.	.	.	1	.	+	.	.	.	.	2	15
<i>Athamanta turbith</i>	E1	.	.	.	.	.	.	r	.	.	.	.	.	.	1	8
Other species																
<i>Robinia pseudacacia</i>	E3b	+	.	.	.	.	.	.	.	.	.	r	+	.	3	23
<i>Juglans regia</i>	E3b	.	.	.	.	.	.	.	.	.	.	r	+	r	3	23
<i>Juniperus communis</i>	E2b	+	.	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Festuca</i> sp.	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	1	8
<i>Juglans regia</i>	E1	.	.	.	.	.	.	.	.	.	.	+	.	.	1	8
<i>Galium aparine</i>	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	1	8
Mosses and lichens																
<i>Schistidium apocarpum</i>	E0	+	1	+	+	1	.	+	+	+	+	+	.	.	10	77
<i>Anomodon viticulosus</i>	E0	+	+	+	.	1	+	.	+	+	1	.	.	.	8	62
<i>Isoetecium alopecuroides</i>	E0	.	.	.	.	+	1	1	1	1	.	1	+	+	8	62
<i>Homalothecium sericeum</i>	E0	1	1	+	+	1	.	.	.	.	+	.	.	.	6	46
<i>Anomodon attenuatus</i>	E0	.	.	.	.	+	1	.	1	+	+	+	.	.	6	46
<i>Homalothecium lutescens</i>	E0	+	.	.	.	1	.	1	1	1	1	.	.	.	6	46

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Number of relevé (tab. 3)		1	2	3	4	5	6	7	8	9	10	11	12	13	Pr.	Fr.
<i>Ctenidium molluscum</i>	E0	.	.	+	.	+	+	.	.	.	.	+	.	.	4	31
<i>Tortella tortuosa</i>	E0	+	1	.	.	.	.	.	.	.	.	.	.	.	2	15
<i>Neckera crispa</i>	E0	.	.	1	.	.	+	.	.	.	.	.	.	.	2	15
<i>Peltigera canina</i>	E0	.	.	.	.	+	.	+	.	.	.	.	.	.	2	15
<i>Brachythecium rutabulum</i>	E0	.	.	.	.	.	.	.	1	.	.	+	.	.	2	15
<i>Rhytidium rugosum</i>	E0	.	.	+	.	.	.	.	.	.	.	.	.	.	1	8
<i>Hypnum cupressiforme</i>	E0	.	.	.	.	1	.	.	.	.	.	.	.	.	1	8
<i>Cladonia pyxidata</i>	E0	.	.	.	.	+	.	.	.	.	.	.	.	.	1	8
<i>Marchantia polymorpha</i>	E0	.	.	.	.	.	.	+	.	.	.	.	.	.	1	8
<i>Polytrichum formosum</i>	E0	.	.	.	.	.	.	+	.	.	.	.	.	.	1	8
<i>Dermatocarpon minutum</i>	E0	.	.	.	.	.	.	+	.	.	.	.	.	.	1	8
<i>Plagiomnium cuspidatum</i>	E0	.	.	.	.	.	.	.	+	.	.	.	.	.	1	8
<i>Mnium</i> sp.	E0	.	.	.	.	.	.	.	.	+	.	.	.	.	1	8

Because we could not find a similar community with the dominant *Aurinia petraea* in literature, we treat the studied stands on rockfall screes as a new association *Arabido turritae-Aurinetum petraeae* ass. nova hoc loco. Its only character species is *Aurinia petraea*, and its differential species are *Arabis turrita*, *Geranium robertianum* and *Ajuga genevensis*. Like *Aurinia petraea*, the first two are biennials, and all three are classified into a similar, transitional (csr) strategy type. They usually grow on stony sites, *Arabis turrita* and *Ajuga genevensis* on dry, and *Geranium robertianum* also on slightly wet sites. The first is a diagnostic species of the order *Quercetalia pubescentis*, and the second of the class *Festuco-Brometea*, while the third occurs in many forest and also ruderal communities. The nomenclature type (*holotypus*) of the new association is relevé No. 6 in table 1. Relevés on fresh, slightly nitrophilous rockfall scree in Morizna and below Osojnica are treated as the variant with *Eupatorium cannabinum* (other differential species are *Acinos alpinus*, *Stachys recta* and *Campanula trachelium*). The relevés on edges of screes above Modrej and the relevé in Loški poldan are temporarily classified into two variants: into the variant with *Galium aparine* and into the variant with the taxon *Satureja montana* subsp. *variegata*. The synsystematic status of these stands, which are floristically considerably different from the others, remains unclear. Considering the dominant presence of *Aurinia petraea* and *Arabis turrita* they are temporarily classified into the association *Arabido-Aurinetum petraeae*.

The established floristic and sociological composition makes the classification into higher syntaxonomical units rather difficult. We described a pioneer's community, a successional stage, and further development is possibly presented in relevé No. 1 in table 3. This is a relevé of an open coppice hop hornbeam forest on stable scree, in which *Aurinia petraea* still grows. The stands described can be treated as a fringe community – on edges of screes, on places in direct contact with the surrounding pioneer's forest stands – classified into the alliance *Geranium sanguinei* because of the predominating proportion of the species from the class *Trifolio-Geranietea*. However, considering that the character and dominant species of the association, *Aurinia petraea*, occupies above all rock crevices, screes and other very stony (sandy) sites (and is only rarely a species of thermophilous forest edges), we find it more appropriate to classify it into the alliance *Stipion calamagrostis*, class *Thlaspietea rotundifolii* (i. e. into the group of montane xerothermophilous communities on calcareous screes), despite its uncharacteristic and species-rich composition. We should also point out a certain similarity with the Central European association *Vincetoxicetum*

A new pioneer community with the dominant *Aurinia petraea* in the Julian AlpsTable 4: Plant life form spectrum in the stands with *Aurinia petraea* in the Soča Valley.Ia: Stands with *Aurinia petraea*, weighted (weight is frequency),Ib: Stands with *Aurinia petraea* (unweighted),

II: Surrounding forest stands (unweighted)

Plant life forms		Ia	Ib	II
Weight		Fr.	Nr.	Nr.
Phanerophytes	P	5.43	7.84	20
	NP	0.72	2.61	5.1
	P caesp	1.99	3.27	7.8
	P scap	0.72	0.65	5.9
	P lian	1.99	1.31	0.8
	P ep	0	0	
Chamaephytes	Ch	7.05	13.1	11
	B Ch	1.27	3.92	4.7
	Ch lich	0.18	0.65	1.2
	Ch frut	0.36	0.65	0.4
	Ch rept	0.36	0.65	0.4
	Ch suffr	3.26	4.58	3.5
	Ch pulv	0	0	0
	Ch succ	1.63	2.61	0.4
Hemicryptophytes	H	75.1	62.7	52
	H bienn	13	6.54	3.1
	H caesp	9.22	10.5	9.4
	H rept	0.18	0.65	1.2
	H ros	5.97	6.54	7.8
	H scap	46.3	37.9	29
	H th	0	0	1.6
	H scand	0.36	0.65	
Geophytes	G	3.62	7.19	15
	G bulb	0.72	1.96	2.7
	G rhiz	2.89	5.23	13
	G rad	0	0	
Therophytes	T	8.86	9.15	2.3
	T scap	8.86	9.15	2.3
	T par	0	0	
Total		100	100	100

hirundinariae Kaiser 1926, which is successionaly connected with fringe communities from the alliance *Geranion sanguinei* and a Scotch pine community (ENGLISCH et al. 1993: 333).

In terms of chorological affinity, the stands of the association *Arabido turritae-Aurinetum petraeae* are dominated by European, Eurasian and paleotemperate species but diagnostically significant is also the proportion of Mediterranean-montane, Southeast European (in the wider sense: Southeast-Alpine, Alpine-Illyrian, Illyrian-sub-Mediterranean) and sub-Mediterranean species (table 6).

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Table 5: Ecological strategy types in the stands with *Aurinia petraea* in the Soča Valley.Ia: Stands with *Aurinia petraea*, weight is frequency,Ib: Stands with *Aurinia petraea*, unweighted,

II: Surrounding stands of hop hornbeam and other deciduous trees, unweighted,

III: Spectrum of strategy types in the German flora (KLOTZ & KÜHN 2002: 201).

c – competitors; s – stress tolerant species; r – ruderals

	Ia	Ib	II	III
	%Fr	%Pr	% Pr	% Gr
c	20	20	34	29
cr	15	8.2	3.3	10
cs	23	26	27	18
csr	39	38	33	26
r	0.4	1.4	0	8
s	1.7	4.1	2.1	5
sr	1.5	2.1	0.4	4
To.	100	100	100	100

Table 6: Chorological groups in the stands with *Aurinia petraea* in the Soča Valley (weighted – weight is frequency – Fr; and unweighted – Nr.)

Chorological groups	Fr.	Nr.
Arctic-alpine species	0.7	0.7
East- and Southeast-Alpine species	3.3	4.1
Southeast-Alpine-Illyrian species	2.4	4.1
Sub-Mediterranean-Illyrian species	1.8	4.1
Southeast-European species	5.7	3.4
sub-Mediterranean species	11	5.5
Mediterranean-Pontic species	1.8	1.4
Pontic species	3.9	4.8
Mediterranean-Atlantic species	0.9	2.7
Mediterranean-montane species	14	12
European species	14	19
Eurasian species	14	16
Eurosiberian species	2.6	4.1
Paleotemperate species	18	12
Boreal species	1.7	2.7
Cosmopolitan	4.6	2.7
Total	100	100

Conclusions

Aurinia petraea is a Southeast European species of rock crevices, scree and sandy sites, whose phytosociological affinity is still poorly investigated (ČERNÍČ 1977, AESCHIMANN et al. 2004, LAKUŠIĆ et al. 2005). Following two powerful earthquakes in 1998 and 2004 in the Soča Valley, numerous rockfalls occurred in the southern Julian Alps and their foothills and swept away or buried several hectares of forest (VIDRIH 1998, 2005). It only takes a few years before pioneer

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vegetation starts growing on newly developed rockfall screes and in places, e.g. in Morizna opposite Trnovo and below Osojnica in the Tolminka valley, one of the most dominant pioneers is exactly *Aurinia petraea*. According to our findings, this species quickly responds to disturbances in its habitat and is also stress tolerant. In addition, because it makes good use of the sources available in given circumstances, it can also be classified among competitors, according to Grime's terminology (1974, 1979, quoted after GRIME 2001, see also BATIČ 2001 and KLOTZ & KÜHN 2002). Its pioneer stands on screes, which developed after earthquakes (and which contain also particles of soil and organic matter), are relatively species-rich (on average 30 species per relevé) and uncharacteristic for scree communities. They already contain a good number of species characteristic for communities of thermophilous forest edges (alliance *Geranion sanguinei*) and dry grasslands (class *Festuco-Brometea*), but relatively few characteristic scree species. As we have not found similar communities previously described in literature, we classify these stands into a new association, *Arabido turritae-Aurinetum petraeae* ass. nova (*holotypus* is relevé No. 6 in table 1). The new association is classified into the alliance *Stipion calamagrostis*, class *Thlaspietea rotundifolii*. Classification into the higher syntaxonomical units is founded on the phytosociological (coenological) affinity (fidelity) of the dominant species of the community (*Aurinia petraea*). Regarding the entire floristic composition, classification into the alliance *Geranion sanguinei*, class *Trifolio-Geraniea*, would also be possible.

Considering the surrounding forest stands of hop hornbeam and other deciduous trees, in some places beech (which also partly grow on rock slides that developed after the previous earthquakes), – table 3, we came to the conclusion that this is a primary succession sere: scree community (*Arabido-Aurinetum petraeae*) – thermophilous edge communities from the alliance *Geranion sanguinei* – open coppice stands of hop hornbeam and other deciduous trees – hop hornbeam and beech forest (*Ostryo-Fagetum*). Similar successional processes are seen on already stable (Holocene) screes above Modrej (below Senica, near Most na Soči), where the stands with the dominant *Aurinia petraea* occur mostly at the contact of more or less sterile limestone screes (with a considerable admixture of chert) and pioneer forests of hornbeam and hop hornbeam (*Asperulo-Carpinetum*). A transitional successional stage, an open hop hornbeam stand with *Aurinia petraea* in the herb layer, was recorded in one relevé (relevé 1 in table 3).

The screes above Modrej are one of the proposed Natura 2000 areas, i.e. a Potential Site of Community Interest (pSCI), which are defined on the criteria of the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. With our research (relevés 16–20 in table 1 and relevé 1 in table 3) we present at least a partial picture of their vegetation.

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Abbreviations

Parent material

A – limestone
AR – limestone with chert
Gr – talus

Soil types

R – rendzina (Rendzic Leptosol)
Li – Lithosols

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Appendix (List of mentioned syntaxa)

- Asplenietea trichomanis* Br.-Bl. in Meier & Br.-Bl. 1934
Amphoricarpetalia Lakušić 1968
Edraianthion jugoslavici Lakušić 1968
Thlaspietea rotundifolii Br.-Bl. in Br.-Bl. & Jenny 1926
Stipetalia calamagrostis Oberdorfer & Seibert in Oberdorfer 1977 (= *Galio-Parietarietalia officinalis* Boşcaiu & al. 1966)
Stipion calamagrostis Jenny-Lips ex Quantin 1932
Vincetoxicetum hirundinariae Kaiser 1926
Drypetalia spinosae Quezel 1967
Peltarion alliaceae H-ić 1956 apud Domac 1957
Koelerio-Corynephorotea Klika in Klika & Novák 1941 (= *Sedo-Scleranthetea* Br.-Bl. 1955)
Alysso-Sedetalia Moravec 1967
Alysso-Sedion albi Oberdorfer & Th. Müller in Th. Müller 1961
Alysso petraei-Sedetum hispanici Schneider-Binder & al. 1971
Molinio-Arrhenatheretea R. Tx. 1937 em. R. Tx. 1970
Festuco-Brometea Br.-Bl. & Tx. 1943
Mesobromion erecti (Br.-Bl. & Moor 1938) Oberdorfer 1957 (= *Bromion erecti* Br.-Bl. (1925) 1936)
Elyno-Seslerietea Br.-Bl. 1948
Trifolio-Geranietea Th. Müller 1962
Origanetalia vulgaris Th. Müller 1962
Geranion sanguinei Tüxen in Th. Müller 1962
Epilobietea angustifolii R. Tx. & Preising in R. Tx. 1950
Galio-Urticetea Passarge ex Kopecký 1969
Stellarietea mediae R. Tx., Lohmeyer & Preising in R. Tx. 1950
Mulgedio-Aconitetea Hadač & Klika in Klika 1948
Erico-Pinetea I. Horvat 1959
Erico-Fraxinion orni Horvat 1959
Ostryo carpinifoliae-Fraxinetum orni Aichinger 1933 (= *Fraxino orni-Ostryetum carpinifoliae* Aichinger 1933 corr. Franz 2002)
Cytisantho-Ostryetum M. Wraber 1961
Vaccinio-Piceetea Br.-Bl. 1939 emend. Zupančič (1976) 2000
Rhamno-Prunetea Rivas Goday & Borja Carbonell 1961
Quercu-Fagetea Br.-Bl. & Vlieg. 1937
Fagetalia sylvaticae Pawł. in Pawł. & al. 1928
Aremonio-Fagion (Ht. 1938) Borhidi in Török, Podani & Borhidi 1989
Lamio orvalae-Fagetum (Ht. 1938) Borhidi 1963
Ostryo-Fagetum M. Wraber ex Trinajstić 1972
Asperulo-Carpinetum M. Wraber 1969
Quercetalia pubescentis Klika 1933
Ostryo-Carpinion orientalis Horvat 1954 em. 1958
Seslerio albicantis-Ostryetum Lausi & al. 1982 corr. Poldini & Vidali 1995
Quercetalia roboris-petraeae R. Tx. 1931

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